

North Dakota

Surveying: Cost Reduction Through Automation

The North Dakota AML Division has started utilizing "Total Station" survey equipment which has resulted in a substantial cost savings. The Total Station equipment includes theodolite, electronic distance meter and electronic field data recorder. Both the Lietz "Set 4" and the Nikon "Top Gun" have been used. A majority of the state's project surveying is now done in-house with the use of just a two-person crew.

In the past, aerial photography and associated mapping work were contracted out to provide pre-reclamation topography maps. These topographic maps were used to develop hand-drawn cross-sections. The cross-sections were then utilized to design the post-reclamation topography and obtain the appropriate earth moving volumes.

Now with the use of the Total Station's electronic field book, its topography program provides fast acquisition of topographical detail. The field book is set to record coordinated of the observed points. The coordinates are recorded in X (easting), Y (northing), and Z (elevation) fashion. These collected coordinates are then fed into the Technical Information Processing System (TIPS). The Interactive Surface Modeling (ISM) portion of TIPS is then used for automated surface modeling, mapping and analysis.

A pre-reclamation topographic map is developed in ISM from the grid which is created from the collected coordinate data. A copy of the pre-reclamation



North Dakota AML Program utilizes "Total Station" and TIPS equipment to enhance project design, construction and post-construction activities.

topography and associated grid is then manipulated to create the post-reclamation topography map and associated grid. The post-reclamation grid is manipulated using the graphic contour line editor function in ISM. The post grid is adjusted until the cut and fill volumes balance and an environmentally sound post-reclamation topographic map is developed. The ISM program is also used to obtain pre- and post- cross sections, 3-D perspectives, cut and fill maps and associated earth moving volumes.

The cost of obtaining a pre-reclamation topography map using aerial photography mapping services, although not bid as a cost per acre line item, works out to be approximately \$25/acre. The cost of obtaining the same topographic map utilizing the Total Station is approximately \$13/acre.

The North Dakota AML Division has also started utilizing the Total Station to do construction project surveying. The program uses the Total Station's "resection" program which determines the coordinates to the instrument station from the sets of observations to known points. The "setting out" program is then utilized to locate points in the field for the purpose of cut and fill staking.

The contracted project surveying, including cut and fill staking, costs approximately \$207/acre. The cost of providing in-house project surveying utilizing the Total Station is approximately \$40/acre.

For more information of questions on the use and benefits of the Total Station, please contact the North Dakota AML at 701-224-4086.

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